AGRICULTURAL Research

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U. S. DEPARTMENT OF AGRICULTURE

AGRICULTURAL
Research

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Advances

Superphosphate was first made and sold in the United States in 1852. So our fertilizer industry looks back on a century of achievement— and looks ahead to a big future.

American farmers are using about 5 times as much fertilizer today as they were 50 years ago. This fertilizer supplies 9.5 times as much nutrients at only 8.8 times the cost.

The world will depend more and more on commercial fertilizer to feed the growing population. Crops won't accept substitutes for the various nutrient elements, each of which performs specific functions in the growth and fruiting of plants. Fertilizer's forms may change—but not the essence.

There's already lots of room to expand fertilizer volume in this country. We use only 11.5 pounds per acre of the 3 main plant nutrients, compared with 49 pounds in western Europe.

Fortunately, we have plenty of raw materials to meet the need, as well as energy and chemicals to do the processing.

We can look for still further advances in fertilizer technology: new kinds of products, higher nutrient levels, improved application methods. Atomic and solar energy may be used in fixing atmospheric nitrogen. Increased soil testing and mounting transportation costs may cause mixed-fertilizer production to shift to smaller local plants.

There's a great opportunity for agricultural research to add to its contributions in improving fertilizer efficiency. Of the nutrients applied to the soil in fertilizer, possibly as little as half are actually taken up by the harvested crop.

We now have the beginnings of a sound body of knowledge on how nutrients are held by soils, the processes by which plants take nutrients from the soil, and their function in plants.

We will do well to place still greater emphasis on basic research in plant nutrition and all of its interrelationships. Such studies should eventually help the fertilizer industry get the information needed to supply nutrients in the best forms for various conditions of soil, climate, and cultural practice.

If we could gain another 15 to 20 percent in fertilizer's efficiency in use, the savings would offset the cost of all publicly supported agricultural research in the United States.

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Awards for Achievement

Scientists and research units recognized by Secretary for outstanding service

■ AT THE ELEVENTH ANNUAL Honor Awards Ceremony May 27, Secretary Ezra Taft Benson gave Distinguished and Superior Service Awards to 134 individuals and 21 work units in USDA.

ARS winners of the Distinguished Service Award:

C. DRECHSLER, *Crops Research Division*, for leadership in pioneering research on fungi, getting basic information significant to the fields of plant pathology, soil microbiology, and antibiotics.

S. E. JOHNSON, *advisor to the ARS Administrator*, for leadership in economic research and application of sound economic principles to agricultural problems of vital concern to farmers and the Nation.

R. T. O'CONNOR, *Southern Utilization Research and Development Division*, for developing spectroscopic methods of analyzing agricultural products necessary for advancing utilization research.

TIME-TEMPERATURE TOLERANCE UNIT, *Western Utilization Research and Development Division*, for developing basic information essential to frozen-food industries on time-temperature tolerance of frozen foods.

ARS winners of the Superior Service Award:

Crops Research Division: H. H. FLOR, for developing, through plant-disease research, the concept that genes for virulence in flax rust contest directly with corresponding defensive genes in the flax plant.

J. R. GARL, for proficient handling of great masses of detailed field and laboratory work essential to a comprehensive alfalfa breeding program.

M. A. HEIN, for leadership in research leading to the betterment of our pasture grasses and the management of pasture and range lands.

L. POWERS, for studies on inheritance of multiple-gene characters in sugar beets and developing techniques for locating superior plants for breeding.

E. R. SEARS, for creative cytogenetics—synthesis of new and useful germ plasm, especially transferrence of leaf-rust resistance to wheat (see p. 16).

Eastern Utilization Research and Development Division: D. GASPARI, for helping solve research problems through design and maintenance of complicated electrical service for a large laboratory.

PLASTICS PREPARATION AND CHARACTERIZATION GROUP, for research on surplus inedible animal fats leading to

commercial production of vinyl stearate, a new and useful fatty component of plastics.

Entomology Research Division: W. B. CARTWRIGHT, for developing practical control of the hessian fly by use of resistant varieties of wheat.

INSECTS AFFECTING MAN AND ANIMALS RESEARCH BRANCH, for synthesizing and evaluating insect repellents and developing an outstanding all-purpose repellent for use on human skin and clothing.

Human Nutrition Research Division: AMINO ACID INVESTIGATIONS UNIT, for determining amino-acid content of proteins and foods through microbiological methods developed by the Unit.

Northern Utilization Research and Development Division: C. H. VAN ETTEN, for developing outstanding micro-analysis methods and interpretations advancing research on antibiotics, dextran, starch derivatives, paints, plastics, and other items.

L. J. WICKERHAM, for advances in biology of yeasts, uncovering principles, activities, and products significant to science, agriculture, industry.

Plant Pest Control Division: J. A. BEAULIEU, for directing a plant-pest-control operation requiring safety and accuracy, and for training inexperienced workers rapidly and effectively.

W. G. REED (retired), for administering Insecticide, Fungicide, and Rodenticide Act of 1947, in coordination with Food, Drug, and Cosmetic Act.

L. W. WILSON, for courageous action in rescuing two small children from a burning car at considerable personal risk from spreading flames.

Soil and Water Conservation Research Division: C. H. M. VAN BAVEL, for working out methods of estimating probabilities of deficiencies and excesses of water in the soil over broad areas, and measuring soil moisture and density on a site.

Southern Utilization Research and Development Division: W. G. BICKFORD, for establishing chemical structure of major components of tung oil and contributing to understanding of basic chemical reactions.

G. S. FISHER and L. A. GOLDBLATT, for discovering novel catalysts and developing a process for manufacturing synthetic rubber and plastics.

R. S. MCKINNEY, for developing the processing of tung fruits and the technology of tung oil and its products, thereby helping make tung a major crop.

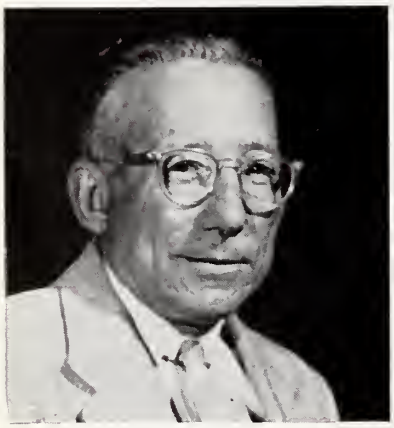
J. SIMPSON and J. R. CORLEY (deceased), for improving fiber orientation during processing of cotton, thereby improving quality of cotton textiles and efficiency of the textile plant.

State Experiment Stations Division: GEORGIAN ADAMS, for developing basic data on composition of foods and for leadership in promoting cooperative research in home economics and human nutrition.

Western Utilization Research and Development Division: J. F. CARSON, JR., for unusually effective and meritorious research in the field of organic chemistry of agricultural products and byproducts.

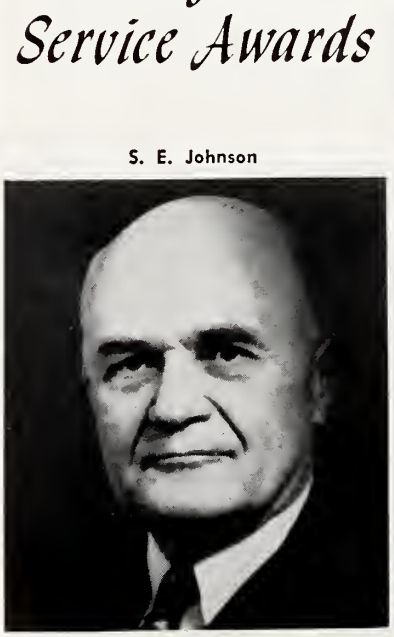
R. H. ELSKEN and T. M. SHAW (former employee), for using nuclear magnetism in devising a unique, accurate, and rapid technique for measuring moisture content of agricultural products. ☆

Distinguished Service Awards



R. T. O'Connor

S. E. Johnson



C. Drechsler

They're finding outside consultants helpful in making a comprehensive review of an area

COMPREHENSIVE REVIEWS—a new tool that several State agricultural experiment stations have been trying out to help evaluate and improve their research—seem to be destined to achieve a second successful year.

The plan is based on panel discussions in which outside consultants join with staff members for an intensive look at a selected area of the station's work.

A number of States found this method so effective last year that they are seeking help on other subjects this year. Some new States will also be given this service.

USDA, station directors, and land-grant-college representatives cooperated in establishing comprehensive reviews. They are conducted under the direction of the State Experiment Stations Division of ARS.

Directors of stations interested in consultations select specialists from a roster of 75 scientists. They are leaders in their fields and are selected from land-grant colleges, other colleges and universities, private industry, and USDA. The panel for each review consists of two of these outside specialists and two representatives from the State Experiment Stations Division. All members of the station department under review participate with panelists in the study. The department head or director presides.

Suggestions based on a thorough examination

Assistance is provided by suggestion—not by control. But the panel's examination is more thorough than the annual review that is ordinarily required of experiment-station research done under Federal grants.

Twenty States asked panel advice on such subjects as agricultural economics and marketing; agronomy; animal and dairy husbandry; food technology; forage crop production and utilization; economics of land and water use; plant pathology and entomology; poultry husbandry; rural sociology; and veterinary science. Reviews of economics research were requested by 11 States.

Consultants review programs from many angles, including scope and methodology of individual projects, the adequacy of interdepartmental participation, and the responsiveness of the research to needs of the States.

Preconference meetings are held between staff members and the panel. Or there is an exchange of information by mail so that an agenda may be established cooperatively and the work accomplished in a visit of 3 to 5 days.

Staff members outline work, join evaluation

Meetings at the experiment station begin with station representatives outlining current work and their concept of the research needs. Then the panel and staff join in evaluation and constructive criticism.

The organization of the entire research effort is examined. The consultants might suggest, for example, that one group would benefit from a seminar. Or the panel might recommend concentration on certain phases of the activities. Sometimes it suggests that two or more departments collaborate on a study. For example, an animal-husbandry study might be expedited if handled in cooperation with the agronomy and economics departments.

Although the station directors and department heads understand State problems and research needs better, panelists may have a more objective viewpoint. They can therefore contribute much to the evaluation of a local problem. They can explore ideas, stimulate thinking, and suggest new directions and approaches in research. At the same time, consultants benefit from the exchange of ideas between panelists and staff members.

Consultants prepare a report to the director, including a record of discussions and recommendations for adjustment of the department's research. ☆

Drip-dry Process for your DRY CLEANER

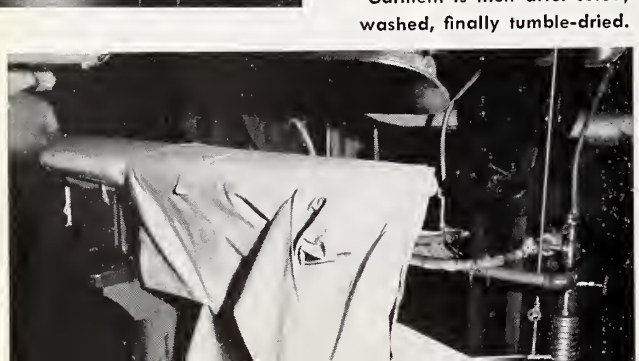
New treatment for all kinds of cotton fabrics appears to be effective and inexpensive

IDENTICAL cotton-cord coats have been washed and tumble dried. Resin-treated garment on the left needs no further attention before it is worn. Treated coat holds creases, resists wrinkling, but untreated coat needs pressing.

GARMENT is placed in resin solution in first step of new low-cost finishing treatment.

SPINNING to exactly right degree of dryness is critical. It's important to leave just the right amount of resin in the garment being treated.

STANDARD hot-head press shapes, dries, presses, cures resin finish in one operation. Precise control at each stage is key to satisfactory result. Garment is then after-cured, washed, finally tumble-dried.



■ A CREASE-HOLDING, wrinkle-resistant finish for cotton garments may soon be as available as your dry cleaner.

This low-cost resin treatment is so promising that you granddaughter may not be able to do without it.

For some time, cotton wash-wear garments have been available on the market. However, the finish is always applied to the cotton before it is made up into clothing. This makes it difficult or impossible to sew flat seams or pockets, because the finish resists creasing, just as it resists ordinary wrinkling while the garment is being worn.

The new method is being developed jointly by USDA's Southern utilization division, in New Orleans, the National Cotton Council, the National Institute of Drycleaning, and various resin manufacturers. Dry cleaners may be able to do the job with their present equipment.

Researchers developed several complex solutions. Chemists R. T. Graham, F. Loibl, and J. R. Wiebush recently tested the most promising one. It contains a thermosetting resin, a thermoplastic resin, a silicone emulsion, two catalysts, as well as a surface-active agent.

The process consists of wetting the garment in the resin solution, then shaping, pressing, drying, and curing the resin finish in a single operation, and after-curing in a hot air cabinet. Finally, washing and tumble-drying readies the resin-treated drip-dry garment for the owner.

Process is simple but too exacting for home use

Although this may seem simple, the process is quite exacting. It's necessary to get just the right amount of resin solution into the garment, to hold pressing equipment at uniform temperature, and to hold the garment on the press for just the right length of time. After-curing time and temperature must also be closely controlled. Because it is necessary to maintain close controls, the process is not suitable for home application by housewives.

Various cotton fabrics—print cloth, denim, sateen, cord, broadcloth, gingham, corduroy, and suiting materials—were tested with highly satisfactory results.

The finish will not last the life of the garments. Cost studies indicate, however, that the process will be inexpensive enough to justify its periodic renewal.

Cleaning treated garments offers no problems. You can still send treated clothes to the dry cleaner, but it is almost as easy to wash them at home. You will give them the same care you now give untreated garments—washing in the washing machine and drying in the dryer or drip drying. And if you still feel you must press treated garments, that's all right but use a *warm* iron. ☆

HARVESTING MADE EASIER

NET HANGS on a trapezoid-shaped frame suspended under cherry tree. About a fourth of the fruit from a tree can be harvested before the net must be moved to another spot.

Picking into net speeds up harvest. Shaking fruit onto net may have practical possibilities as a great labor saver

HARVESTING cherries with a minnow net may seem odd. But it's one of the promising leads uncovered in preliminary USDA studies on improving cherry harvesting and reducing bruising. (Bruising is the industry's biggest headache, causing spoilage, scald, and an inferior product.)

It's probably impossible to eliminate bruising altogether in present commercial picking and canning. ARS chemists R. T. Whittenberger and C. H. Hills of the Eastern utilization division, Philadelphia, found that most severe bruising occurs during harvesting, especially when picking cherries above shoulder height.

The researchers experimented with a new technique developed at Michigan Agricultural Experiment Station and found it greatly reduces bruising. Cherries are loosened from the tree with the fingertips and allowed to fall into a minnow net suspended on a frame under the tree. The net absorbs the impact of the fall from the tree.

Cherries harvested in this way bruised only slightly as they struck twigs or branches during their fall to the net. Only a trivial amount of scald developed. Cherries kept well for a week at 35° F. with no spoilage. They could be stockpiled for a few days and processed as needed. This would eliminate brief and spotty plant operation, avoid plant overloading, and reduce the number of soaking tanks and amount of water needed.

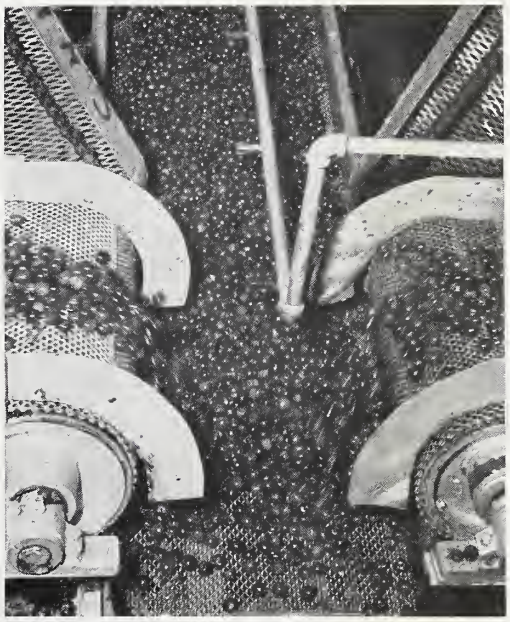
In 10 tests with 4 pickers, net-harvesting yielded an average of 36 percent more cherries than did pail-picking during the same time.

Shaking is fast, bruises fruit

In other tests, ripe cherries were *shaken* from trees onto the net. Almost 10 times more cherries were harvested in the same time as with pail-picking. Studies showed one worker could harvest 100 pounds of cherries in a little over 10 minutes.

Although the branch-shaking method bruises the cherries as much as pail-picking, the speed of this method may outweigh the disadvantage of bruising in commercial practice. Labor is one major expense in cherry production. At present, a large, temporary, and hard-to-get labor supply is needed for harvesting. It's possible that such costs may be reduced by about 90 percent by using the branch-shaking method and a net.

A variation in branch-shaking also resulted in rough separation of cull and good cherries. Culls are loosely attached to the tree and will fall first. In one test, a preliminary shaking produced a harvest containing nearly 50 percent culls. This harvest was discarded. Later shaking produced mostly good cherries.



BRUISING also occurs in plants. Cherries are dropped in processing an average accumulative total of 23 feet.

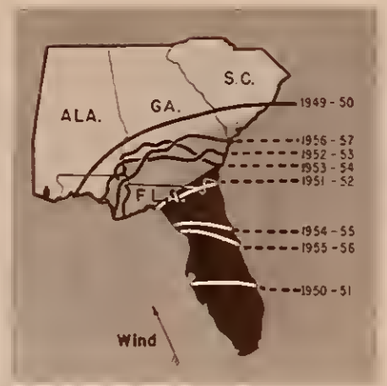
Better handling method needed

Research has already shown how some of the bad effects of orchard bruising may be met. Cooling of cherries in ice water within a half hour after picking, for example, greatly retards spoilage and development of scald. But much more testing needs to be done under practical orchard conditions to offset bruising.

At present, neither the frame-picking nor the branch-shaking is done commercially. ARS researchers are continuing study of both methods. ☆

SCREWWORM SCREWWORM

1. Second-floor foundation colony provides a continuous supply of eggs for the mass fly-rearing operation.



DARKLY SHADED area, where screwworm ordinarily overwinters, will receive most sterile flies. A future mild winter might call for intensive operations in lightly shaded areas. Bars show northernmost overwintering.

2. Female lays up to 250 eggs on medium. Weighed batches of 100,000 eggs are incubated overnight.

TRIPLE-TRAY VAT rears 140,000 larvae at a time. Electronically heated trays keep larval food (finely ground meal, citrated blood, and water) at about 100° F. to simulate temperature in wound of a cow, where larvae normally develop.

3. Hatched larvae grow up during 5½-day "diner" trip, crawl off trays, fall to first-floor moving sand bed.

4. In 8-hour ride, larvae burrow into sand, form their pupal cases, start their metamorphosis to adulthood

RECONVERTED airplane hangar at Sebring houses fly-rearing operation moving at tempo of the fly life cycle.

Modern factory methods and atomic science convert the pest into a "fifth column" to rid big livestock area of the s:ies

■ FIFTY MILLION RADIOACTIVELY sterilized screwworm flies (half of them males) will be pitted against native or wild members of their species each week when the screwworm-eradication campaign in the Southeast reaches full-scale operation late this summer or early fall. This joint undertaking by Southeastern States and USDA will take place over an area of about 50,000 to 75,000 square miles, including all of peninsular Florida.

Tests have shown that sterile male screwworm flies can compete successfully with native males. A female mates only once, and when she mates with a sterile male fly her eggs do not hatch. By continuing the release of large numbers of sterile male screwworm flies over the infested area, it's possible to reduce the screwworm population and eventually eradicate it. The eradication effort now underway marks the first time in history that this new research-developed weapon of exterminating a species of destructive insects through sterile matings has been tried on such a large scale. Previous trials have been on a much smaller scale.

The technique has been successfully tried out in three locations by ARS entomology researchers. They got good results from a field test on Sanibel, a small island off the West Coast of Florida, in 1953. In 1954 they completely eradicated the fly from the 170-square-mile island of Curacao in the Caribbean (AGR. RES., October 1954, p. 8; November 1955, p. 3). And a pilot-scale operation was successful in 1957 over 2,000 square miles of area around Orlando, Fla. This is the setting for the new work.

Mass fly-rearing developed by research

The mass-rearing methods and equipment used in the current program have been developed by ARS entomologists, equipment specialists, and veterinarians. The screwworm-fly colony was increased in preparation for mass rearing at the ARS Entomology Research Laboratory at Orlando. The flies are from a native Florida strain selected for high mating capacity. Facilities there have been used to the maximum since January in trial runs to test new equipment and train personnel in fly rearing. Though distributed in relatively small numbers, the sterile flies have helped to restrict the development of screwworm populations in northern Florida noticeably.

Work flow is timed to fly's life rhythm

At Sebring, an airplane hangar 160 x 200 feet in size, with a second floor added, has been converted to a fully mechanized "assembly-line" type of mass-rearing plant. All operations are synchronized to the life cycle of the insect. An adjacent building 32 x 76 feet, houses the 6 cobalt-60 irradiation units, obtained with the help of the Atomic Energy Commission. Space has been arranged for several fly-distribution centers at airports strategically located at various points in the area to be treated.

Refrigerated storage is provided for 83,000 pounds of meat and some 4,000 gallons of blood used each week to produce larvae. Special air-purification equipment has been installed to get rid of toxic ammonia fumes and nauseous odors developed in larva-rearing.

Sterilized flies are delivered to airport distribution centers in air-conditioned vehicles. Cardboard cartons of flies are loaded into airplanes equipped with special devices that will open the cartons as they are released in the air. At full operation, 100,000 cartons will be dropped over the infested area weekly. Each carton will contain approximately 500 flies, half of them males. The rate of release will vary from 200 to 800 sterile males per square mile, depending on the number of screwworm flies reported in an area by ground surveys. ☆

IRRADIATION in this cobalt-60 unit stops sexual maturation of insect, but it emerges into otherwise normally functioning adult screwworm fly.

JUST BEFORE emerging from pupal case, irradiated insects are packed in boxes in which they will make final change into adult winged flies.

RELEASING device on bottom of plane opens and dumps a box of flies every few seconds, about 1,000 boxes per trip.

5. Pupae are screened out of sand at sifting station.

9. Now adult, sterile flies are air dropped. Each male mating with a native female sends her eggs infertile.

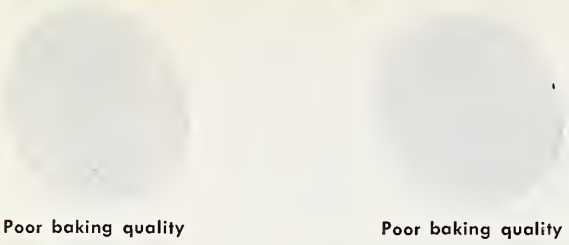
8. Near-adult sterile pupae are packed several hundred per box, hauled to airports by air-conditioned vehicles.

7. Two-quart canisters of pupae (18,000) are exposed to cobalt 60. Gamma rays destroy ability to reproduce.

6. Trays of pupae take a 5½-day ride around warm, humid holding quarters.

TESTING DRY MILK FOR BREAD MAKING

Intensity of test spots quickly reveals if milk has been suitably processed



Poor baking quality

Poor baking quality

Poor baking quality

Fair Baking Quality

Good baking quality

Good baking quality

■ THERE'S A NEW WAY OF checking whether nonfat dry milk has been manufactured to best advantage for baking bread. USDA's Agricultural Marketing Service developed a test based on the fact that better nonfat dry milk for breadmaking has more denatured whey proteins.

Whey is the watery part of the milk separated from the more coagulable curd. The proteins found in this whey are naturally in solution under mild acid conditions. But heat may change the nature of these proteins (denature them) so that they will precipitate as solids in the presence of acids. The physical differences brought about by heat affect the behavior of milk proteins in a bread mix.

When high heat is used to denature whey proteins in the making of nonfat dry milk, bread made from this dry milk has a greater capacity to absorb water. The dough does not have to be worked as long. It is not too soft or too slack. The bread also has more volume per loaf, and the texture and crumb of the loaf are likewise superior.

If skim milk is prewarmed and dehydrated at low temperatures, the resulting nonfat dry milk, when reconstituted, is rather like fresh milk. Dry milk of this kind curdles readily and is better for making cottage cheese. But when fresh skim milk is heated at a high temperature (180° to 190° F. for 30 minutes) and then dried, it is better for making bread. The skim milk is dried by spraying it through a nozzle into hot air to produce powder of the type that is best for the baking of bread.

Samples can be rated for baking quality

Researchers now can quickly distinguish between nonfat dry milk samples and rate them in terms of good, fair, and poor quality for baking purposes.

The method was developed by AMS chemists Louis Feinstein and W. A. Moats. To quickly estimate whether the nonfat dry milk is suitable for making bread, the scientists reconstitute the dry milk in water, add 0.5 percent acetic acid to precipitate the casein and denatured whey proteins, and filter the mixture.

Filter paper is spotted with the filtrate—now free of casein and denatured whey protein but containing the undenatured whey protein, which was not precipitated out. The paper is dried, stained with 0.1 percent bromphenol blue in ethanol saturated with mercuric chloride. The protein reacts to form a blue complex.

The intensity of the blue stain shows how much undenatured whey protein there is in the filtrate—that is, how much original whey protein remained undenatured in the nonfat dry milk. If the color is pale, the undenatured whey protein content is low, and the baking quality of the nonfat dry milk will be good. If the color is strong, the dry milk is not as satisfactory for bread, but is suitable for the making of cottage cheese. ☆

BETTER MILLET FROM A FOUR-WAY CROSS

Unique seed-production method gives us a valuable summer annual for grazing

SCIENTIST Glenn Burton bags flowerhead of inbred millet he originated as one parent of new hybrid.

CATTLE graze field of Gahi–1 millet at Coastal Plain experiment station where hybrid originated. This summer annual gives abundant high-quality forage when most pastures in South are sparse.

GAHI–1 PEARL MILLET, produced by interpollinating four inbred lines, may offer southern stockmen better summer grazing. Certified seed may be available in limited quantity in 1959, and in good supply in 1960.

Gahi-1 is believed the first experiment-station-developed F_1 hybrid annual forage grass released to farmers.

This new millet starts faster from seed, recovers faster when grazed or mowed, and yields considerably more forage per acre than millets now grown. Gahi-1 also gives better seasonal distribution—yields nearly three times as much late in the season.

Limited grazing studies suggests that Gahi-1 (short for Georgia Hybrid No. 1) is equal to Starr millet in quality and is definitely superior in production. It is well adapted to conditions throughout Georgia and most of the Southeastern States.

The inbreds were developed in cooperative research by USDA and the Georgia Agricultural Experiment Station at Tifton. Growing an equal mixture of the four inbreds resulted in 65 to 75 percent hybrid seeds. It's not necessary that all seeds be hybrid since the vigorous hybrid plants choke out the weak, young inbreds.

Gahi-1 will give best results if planted at the rate of 10 pounds of certified seed per acre in cultivated rows 30 to 36 inches apart. Planted at lesser rates, hybrid plants may be too sparse to effectively choke out the weaker inbred millet seedlings.

Millet meets summer need

Millet is an important crop for summer grazing in the South, where pastures tend to dry up from heat and drought. Test plots of the new hybrid at Tifton have yielded 50 percent more forage than common pearl millet and use fertilizer and water more efficiently. Millet is particularly good for dairy herds, since it has a stimulating effect on milk production, but offers equally good grazing for all classes of livestock on the farm, including hogs and beef cattle.

New hybrid fits forage plan

Well-fertilized Gahi-1 apparently will provide 2 grazings by dairy cows and then 20 tons or more of silage per acre. The hybrid is more vigorous and grows taller than other varieties and therefore requiries careful management when used for grazing.

The best planting season in the Tifton latitude has proved to be in late April and early May. Where top-quality (young) forage for lactating cows is desired through the summer, extra plantings can be made in June and July. When the latter plantings are ready for grazing, the older plantings can be used for young stock or dry cows, or be cut for silage.

Second-generation Gahi-1 millet, like second-generation hybrid corn, yields much less and seed should not be saved for replanting from fields planted to the commercial hybrid. ☆

CARRYOVER of pest on seed shell weakened plant at left, grown from infected nut. Shell was removed from seed that grew plant at right.

NEMATODES DO CUT PEANUT YIELD

Researchers discover that unsuspected meadow nematode feeds on pegs and shells

LESIONS of meadow nematode appear on shells, stems of Spanish peanuts.

EFFECTS of nematodes from infected runner peanuts left in soil over winter are seen on next plants (left) grown in same soil. Plants at right grew in soil containing no infected nuts during previous winter.

■ NEMATODES HAVEN'T BEEN considered a threat to peanuts, and it's true the root-knot nematode is no such problem in most places. Research now shows peanuts are often heavily damaged by meadow nematodes.

This finding suggests that we need to improve our agronomic practices, especially where peanuts are rotated with other highly susceptible crops.

Meadow nematodes had been overlooked because these pests center their feeding on the fruiting pegs and shells of the peanut plant, rather than on the roots, where cotton, corn, and tobacco are primarily damaged. This important habit of meadow nematodes has just been discovered in cooperative studies by USDA and the Georgia Agricultural Experiment Station.

Georgia pathologist L. W. Boyle started the studies at the Experiment, Ga., substation some years ago. He showed that the meadow nematode (*Pratylenchus brachyurus*) can be carried into noninfected soil on the shells of infected peanuts. Shelled seeds, however, did not infect the soil since the pest does not enter the kernels. By fumigating infected soil, Boyle reduced harvest leavings of nuts in the soil. He concluded that peg infection by the nematode causes many nuts to be left in the soil at harvest and that the leavings, in turn, build up infection in the soil.

Pest carried over on shells

More recent studies by ARS nematologist J. M. Good fortified this belief. In a field at the Coastal Plain substation, Tifton, where many peanuts had been left by the harvester 2 years before, there were large patches of chlorotic plants in the current peanut crop. Good found many nematode lesions on the pods in those patches. (Nematode lesions are dark to purplish brown areas with a distinct margin, in contrast to lighter colored rot lesions that blend into the background of healthy tissues.) There were adults, larvae, and eggs of the nematode in those dark lesions—frequently several hundred adults in a single lesion. In fact, gram for gram, lesion-marked pods have six times as many nematodes as the roots of the same plants or the pods of plants from healthy areas. (In another study,

there were eight times as many nematodes on pods as on roots.)

Winter, drying don't kill it

Good proceeded to prove that the nematode is capable of remaining alive in shells after harvest, even after the customary drying of the nuts to 10 percent moisture. He also proved that the nematodes in shells of peanuts left in the ground after harvest can infect the next crop. He fumigated potting soil to kill the nematode and planted 15 nematode-infected peanuts in each of several pots. The pots were left outdoors all winter. During the following summer, heavy nematode infestations showed up on peanuts and corn grown in the pots thus inoculated with the pest. Plants grown on the fumigated soil in some other pots without buried nuts remained free of nematode infestations.

In one study, row-fumigation of the field plots before planting reduced nematode counts by 93 to 98 percent and improved yields. More farm trials will be needed, however, to learn whether it may pay to fumigate rows for planting or to sidedress with nematocides as blooming starts.

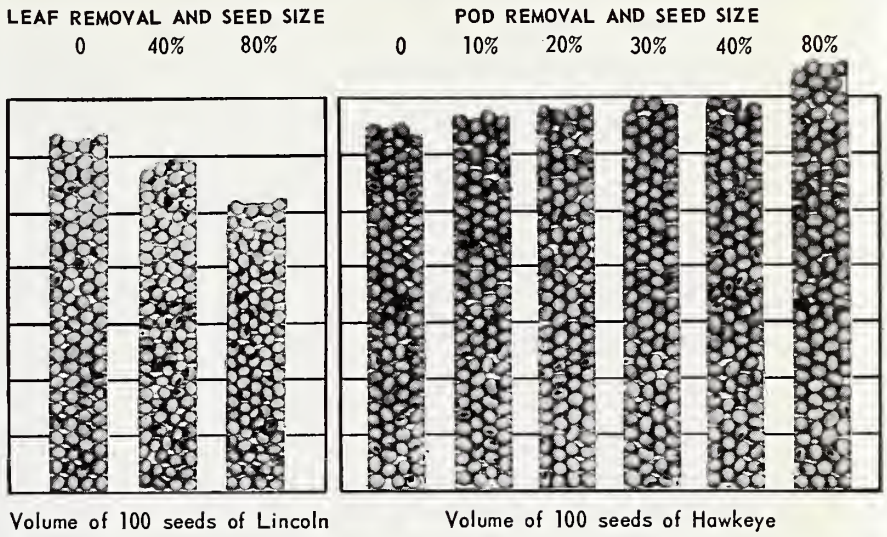
If peanuts are harvested early and a clean job of harvesting is done, most of the pests in shells will be removed. In that case, there is no objection to keeping the peanuts in rotation along with the even-more-susceptible crops—cotton, corn, and tobacco.

Better practices suggested

We should definitely avoid planting whole pods in areas where that is still the practice, in order to minimize the spread of the meadow nematode.

Peanut shells have come into extensive use for garden mulches and fertilizer extenders near peanut crushers. We now know these practices build up the numbers of this pest. Contrary to popular belief, the meadow nematode can cause great damage to many southern crops and gardens. ☆

How Pod and Leaf Losses Affect SOYBEANS



■ Soybeans can lose up to 40 percent of their pods and still produce a normal yield. USDA research shows that nature compensates for pod loss by increasing seed size and decreasing natural pod shedding.

Weather conditions such as temperature extremes, high humidity, excessive rain or hail storms take a heavy toll of pods. Some varieties seem to shed heavily. Growers concerned that pod loss means yield loss can take heart from experimental results that show otherwise.

ARS plant physiologist D. F. McAlister and chemist A. O. Kreber, U. S. Regional Soybean Laboratory, Urbana, Ill., studied effects of pod removal on plant growth, yield, seed size, and chemical composition.

The researchers found that removing even 10 percent of the pods increased seed size. Removing 80 percent caused a 23-percent increase, although it cut the yield almost in half. Plants depodded this severely had dark green leaves, thick, green stems, and plump pods.

Removal of *leaves*, however, is a different story. Removing 80 percent after pods were set decreased seed size by 18 percent and yield by 50 percent. A 40-percent defoliation cut yield about 20 percent.

Depodding causes larger and heavier seeds because the normal leaf area supplies food to a smaller-than-normal number of seeds, which thus get plenty. Conversely, defoliation causes smaller and lighter seeds because fewer leaves are left to nourish the large number of seeds.

The composition of the seeds was significantly affected by pod removal and defoliation. Removing 80 percent of the pods increased the protein, sugar, and leaf-starch content, and decreased the oil and ash. Removing 80 percent of the leaves decreased the protein and oil content.

Effects on stem composition suggest that part of the food normally manufactured in the leaves accumulates in the stems of plants depodded most severely. Depodding of 80 percent, for example, increased protein by 57 percent, sugars by 105 percent, and starch by 95 percent.

Researchers aren't sure of the implications of these findings. But the information will likely be useful in interpreting research data on diseases causing pod and leaf losses, and losses due to hail. ☆

DON'T MIX COWS and TIMBER

Both do better when they're kept separate and managed to bring the best returns

PASTURING AND TREE-GROWING do not mix profitably in the central hardwood areas, but tree-growing can be worked into the whole farm enterprise using woodlands for timber production. This was shown in studies by USDA's Central State Forest Experiment Station in cooperation with Southern Illinois University.

Woodland pasture is poor fare for cattle. Studies in Illinois show nearly 18 acres of woodland are needed in a normal year to maintain the body weight of a 700-pound steer during the pasturing season. A similar steer lost 75 pounds by July 20 on 12 acres of woodland pasture. The studies were made in hardwood areas where browse vegetation was low nutritionally and grasses were sparse. Grasses under woodland shade have less carbohydrates and other nutrients than grasses in open pastures.

Heavy grazing of animals on sloping woodland increased water runoff in one year to 9,308 gallons per acre from 197 gallons, in a Wisconsin study. The grazing packed the soil, reduced leaf litter, and lowered rates of moisture absorption. This slowed the tree growth.

Cattle should be fenced out or land cleared

A small area of central hardwood near improved pasture may be saved for cattle loafing and protection, but the rest of the woodland should be fenced to keep out livestock. If more pasture is needed, it is better to clear and convert the area to improved grazing land.

Some land, perhaps because of topography or flood susceptibility, may be best suited for growing timber as a crop while protecting the basic resources of soil and water. Under favorable conditions, trees can yield around 15 percent interest—as good as cattle or better.

Farmers should learn to recognize a few classes of trees—and which ones to kill or cut to make desirable timber grow faster. Owners should learn how to protect and build up forests and harvest and sell the crops.

Trees are classed in the study as good growing, mature, overmature, defective, or unmerchantable. Good growing trees have straight, sound trunks and are relatively free of branches, scars, holes, and rotten knots. These trees are able to withstand high winds. They are well developed with a vigorous crown and full foliage.

Mature trees—those at a point where the value of annual growth falls below a point acceptable to the owner—should be harvested within 3 years. Overmature and defective trees should be cut as soon as it is possible to do so.

When only good growing trees are left, there's more room for growth. Quality will be better, seeding easier. And growth rate could increase twofold or threefold within 5 years after the competing poor stock is removed.

Farmers may harvest trees or sell on stump

Farmers can do their own harvesting if: (1) they are skilled at woods work or can get skilled help; (2) they can get necessary equipment—light tractor, power saw, and truck; (3) there is a ready market for logs.

Otherwise, farm woodland owners could sell the standing trees on the stump and let the buyers do the cutting—a customary way in many sections of the country. Home uses—for example, fences or lumber for additional buildings—may be the wisest use of many small woodland products composed of low-quality material.

Return per acre is usually much higher from farm crops than from timber, but the labor requirement and size of the investment are also much greater. On the basis of man hours worked or money invested, timber-growing compares favorably with usual systems of crop-farming. ☆

Poultry test building

A new brick-concrete brooder house that will aid research on poultry breeding, genetics, nutrition, and physiology will soon be ready for use at USDA's Agricultural Research Center, Beltsville, Md. It will take the place of about 70 small brooder houses and will provide ARS poultry researchers with their first opportunity to conduct broiler research under commercial-type conditions. The new building is also expected to speed up research operations by restricting environmental variables.

Windows comprise most of the building's walls. These awning-type, aluminum-framed windows provide light and air and make unnecessary a forced-draft ventilating system. A concrete floor will aid sanitation.

A gutter down the 8-foot-wide center aisle will permit installation of a mechanical barn cleaner to remove used litter. Pens 16-feet deep are on both sides of the aisle. Pen widths can be adjusted. An overhead track down the aisle will expedite the work of caring for chicks. The aisle provides ample room for such jobs as weighing feed and birds, sorting families, and selecting cockerels.

Compact mums in prospect

Extremely short-stemmed chrysanthemum plants bearing full-sized blossoms have resulted from work of USDA plant scientists with a new

chemical growth retardant, Amo-1618. These tiny plants are ideal for small, well-shaped potted flowers.

The chemical has been tested on many plants. So far, a few in addition to chrysanthemums have proved responsive to the chemical in varying degrees. They include beans, calliopsis, sunflower, salvia, and sesame.

Home gardeners may someday use Amo–1618 on their own mums. However, until industry develops a practical way of manufacturing the chemical, only a few researchers will get it.

Crossbreeding studies

Whether or not crossbreeding of dairy cattle can usefully serve our dairy industry is the subject of a study just begun by USDA dairy scientists at the Agricultural Research Center, Beltsville, Md. The study should give us more information on the value of crossbreeding for rapid herd improvement through the use of sires from artificial-breeding establishments.

Scientists in this long-range investigation will compare purebred Brown Swiss, Ayrshire, and Holstein cows with crosses of the same breeds. Test matings are planned so that two-way and three-way crosses can be compared in the same generation.

Results will be evaluated on the basis of milk production, butterfat content, solids-not-fat production, breeding qualities, birth weight, growth of calves, and feed efficiency.

Three new head lettuces

Seeds for three new lettuce varieties originated at USDA's Agricultural Research Center, Beltsville, Md., become available for sale to the public this month. They are Golden State A, Golden State B, and Lakeland.

Golden State A and Golden State B were developed in cooperation with the California Agricultural Experiment Station and tested extensively in California's Salinas-Watsonville district. Both varieties are very large, dark-green, slow-bolting, tipburn-resistant, crisp head lettuces. They

mature at the same time as popular strains of Great Lakes. Both varieties hold well at maturity and are reported to have fine eating quality.

Lakeland, developed in cooperation with the Wisconsin Agricultural Experiment Station, has been tested extensively in several northern lettuce-producing districts. It is a medium-sized, medium-green, very slow bolting, crisp head lettuce resistant to tipburn and rib discoloration. It also has excellent eating quality.

Rust-resistant oats

Eleven strains of cultivated oats carrying resistance to race-264 crown rust—one of the most virulent of 5 new races threatening our oat crops—have been found by USDA scientists. These strains may also have resistance to some of the other new races.

Five new rust races were found last spring in Florida and southeastern Georgia, and later on in several northern States. Neither Federal-State nor commercial oat breeders had any adequately resistant material, except wild varieties that were difficult to cross with the various cultivated oats.

Discovery of the resistant oats came through emergency studies undertaken cooperatively last winter in Puerto Rico by ARS, the Federal Agricultural Experiment Station at Mayaguez, and the Puerto Rico Agricultural Experiment Station at Isabela.

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Seeds of more than 4,800 different oats were assembled by D. J. Ward, in charge of the USDA World Oat Collection at Beltsville, and sent to Puerto Rico last year. Of this number, 3,573 were from the World collection of cultivated and wild oats. The rest were experimental varieties submitted by Canadian and American oat breeders. Nine wild oats and 27 cultivated ones from the World collection are resistant to race 264. The 27 cultivated oats fall into 11 resistant strains, each apparently possessing a different basic genetic source of resistance to the virulent race 264 of crown rust.

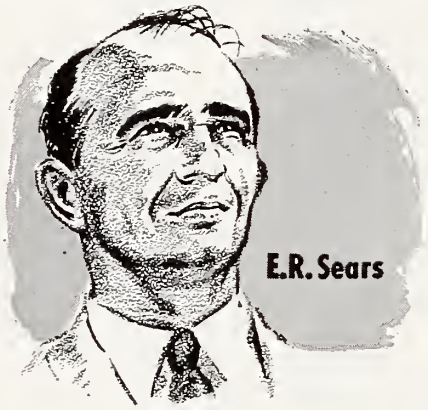
Seed of resistant lines has been sent to 75 American and Canadian plant breeders and pathologists.

Sears wins high award

E. R. Sears, USDA plant geneticist at Columbia, Mo., has received one of the Nation's top honors in research—the $10,000 Hoblitzelle National Award in Agricultural Sciences.

ARS Administrator B. T. Shaw presented the award May 21 at the Texas Research Foundation annual field day at Renner. To receive the award, Sears flew back from Western Germany, where he is studying under a Fulbright scholarship.

Sears was selected for the biennial award for his successful transfer of rust resistance from a wild grass to wheat (AGR. RES., August 1956, p. 8). His far-reaching work in this field has given us a promising answer to control of one of our worst wheat diseases. Perhaps even more important, his transfer methods can be used



to improve other crops.

For 22 years, Sears has made internationally important contributions in cytology and genetics of common wheat and its relatives. His work with aneuploids in wheat has opened up entirely new possibilities for the economic improvement of that crop (AGR. RES., May 1956, p. 7).

The 48-year-old award winner is a graduate of Oregon State College and holds A. M. and Ph. D. degrees from Harvard. Since 1936, he has been employed by ARS, conducting genetic studies of wheat, wheat hybrids, and wheat relatives at Columbia, Mo.

This award was established in 1950 by the Hoblitzelle Foundation to stimulate basic scientific research and encourage scientists to solve our major agricultural problems.

New cotton-fabric study

Use of metal compounds to give cotton fabrics better resistance to weathering, mildew, and rot, as well as added flame resistance, and increased water repellency will be investigated by the Texas Woman's University, Denton, under contract with USDA. The contract was negotiated for USDA by the Southern utilization division, New Orleans.

Researchers will find whether it's feasible to use several laboratory-screened metal compounds to improve fabrics for indoor and outdoor use. For instance aluminum, magnesium and cobalt hydroxides and cobalt metaborate show promise for improving cotton's resistance to weathering, mildew, and rot. Aluminum and magnesium hydroxides may increase its flame resistance, and cobalt metaborate increases its water repellency.

Virus in wild blueberries

Contrary to popular belief, wild blueberry plants are veritable reservoirs of yield-cutting blueberry stunt virus, USDA and State scientists learned from studies in New Jersey.

The disease wasn't recognized in the highbush or other wild species. Growers believed, therefore, that stunt virus in their cultivated blueberries came in from other States.

Growers generally isolate their new plantings from old fields and consider that adequate protection. The scientists have concluded, however, that growers will need to control leafhoppers (carriers of the virus) and possibly destroy nearby native blueberries to curb this disease.

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